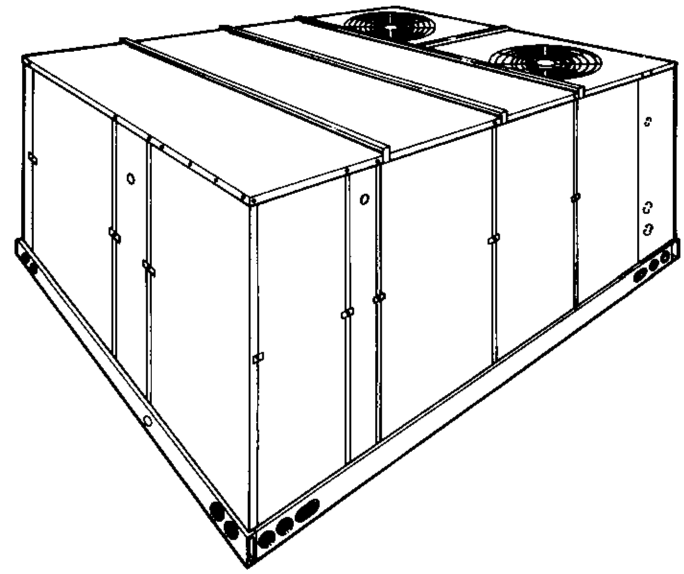
YORK®

SUNLINE 2000™
SINGLE PACKAGE AIR-TO-AIR HEAT PUMPS

INSTALLATION INSTRUCTION

Supersedes: Nothing | 035-18895-000-A-0902

MODELS B2CH180
(WORLD 50 HZ)



GENERAL

YORK Model B*CH units are single package heat pumps designed for outdoor installation on a rooftop or a slab. These units can be equipped with factory installed electric heaters for supplemental heating applications.

The units are completely assembled on rigid, permanently attached base rails. All piping, refrigerant charge, and electrical wiring is factory installed and tested. The units require only electric power, duct connections and installation of fixed outdoor air intake damper (units without economizer or motorized damper option only) at the point of installation.

These units are designed and manufactured under ISO 9002 Quality System Certification

The supplemental electric heaters have nickel-chrome elements and utilize single point power connection.

INSPECTION

As soon as a unit is received, it should be inspected for possible damage during transit. If damage is evident, the extent of the damage should be noted on the carrier's freight bill. A separate request for inspection by the carrier's agent should be made in writing. See Local Distributor for additional information.

REFERENCE

Additional information on the design, installation, operation and service of this equipment is available in the following reference documents:

- 55.70-N7- General Installation
- 55.70-N2 -Pre-start & Post-start Check List
- 44-320-10 - Barometric Relief Damper Accessory
- Renewal Parts: - Refer to the Renewal Parts Manual for complete listing of replacement parts on this equipment.

All forms referenced in this instruction may be ordered from:

Standard Register
Norman, Oklahoma 73069
Toll Free Telephone: 877-318-9675
Toll Free Fax: 877-379-7920

CAUTION
THIS PRODUCT MUST BE INSTALLED IN STRICT COMPLIANCE WITH THE ENCLOSED INSTALLATION INSTRUCTIONS AND ANY APPLICABLE LOCAL, STATE, AND NATIONAL CODES INCLUDING, BUT NOT LIMITED TO, BUILDING, ELECTRICAL, AND MECHANICAL CODES.

WARNING
INCORRECT INSTALLATION MAY CREATE A CONDITION WHERE THE OPERATION OF THE PRODUCT COULD CAUSE PERSONAL INJURY OR PROPERTY DAMAGE.

Installer should pay particular attention to the words: *NOTE, CAUTION* and *WARNING*. Notes are intended to clarify or make the installation easier. Cautions are given to prevent equipment damage. Warnings are given to alert installer that personal injury and/or equipment damage may result if installation procedure is not handled correctly.

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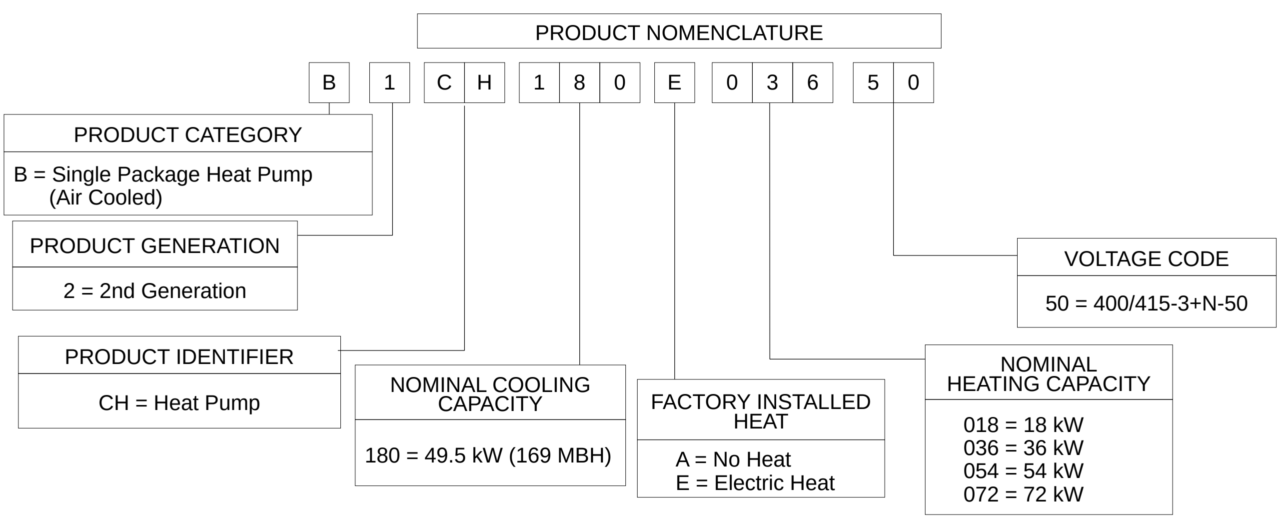


INSTALLATION

LIMITATIONS

These units must be installed in accordance with applicable national and local or municipal safety codes.

Refer to Table 1 for Unit Application Data and to Table 2 for Electric Heat Application Data.

If components are to be added to a unit to meet local codes, they are to be installed at the dealer's and/or the customer's expense.

TABLE 1 - UNIT APPLICATION DATA

Voltage Variation (Min. / Max.)	400 / 415V	360 / 456V
Wet Bulb Temperature of Air on Indoor Coil, (Min. / Max.)	°C	14 / 22
	°F	57 / 72
Dry Bulb Temperature of Air on Outdoor Coil, (Min./ Max.)	°C	7 / 52
	°F	45 / 125

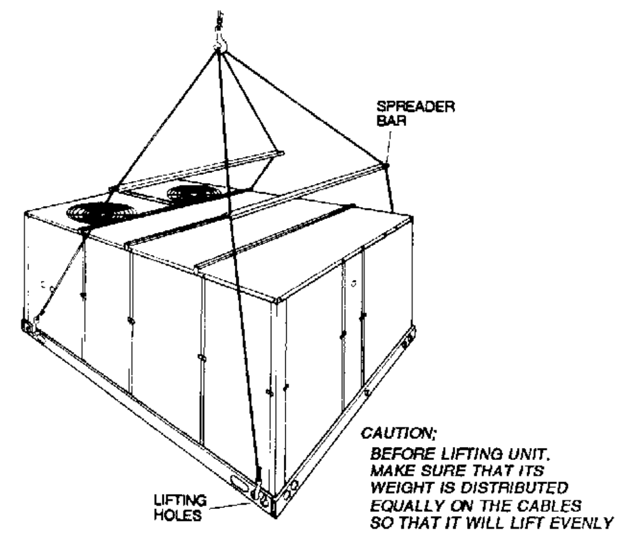


FIG. 1 - TYPICAL RIGGING

LOCATION

Use the following guidelines to select a suitable location for these units.

1. Unit is designed for outdoor installation only.
2. Outdoor coils must have an unlimited supply of air.
3. For ground level installation, use a level concrete slab with a minimum thickness of 102mm (4"). The length and width should be at least 152mm (6") greater than the unit base rails. Do not tie slab to the building foundation.
4. Roof structure must be able to support the weight of the unit and its options and/or accessories. Unit must be installed on a solid level roof curb or appropriate angle iron frame.

   CAUTION: If a unit is to be installed on a roof curb or special frame other than a YORK roof curb, gasketing must be applied to all surfaces that come in contact with the unit underside.

5. Maintain level tolerance to 13mm (1/2") maximum across the entire length or width of the unit.

RIGGING AND HANDLING

Exercise care when moving the unit. Do not remove any packaging until the unit is near the place of installation. Rig the unit by attaching chain or cable slings to the lifting holes provided in the base rails. Spreaders, whose length exceeds the largest dimension across the unit, **MUST** be used across the top of the unit. Refer to Figure 1.

Units may also be moved or lifted with a forklift, from the front or rear only, providing that an accessory skid is used.

LENGTH OF FORKS MUST BE A MINIMUM OF 2286mm (90").

Refer to Table 3 for unit weights and to Figure 2 for approximate center of gravity.

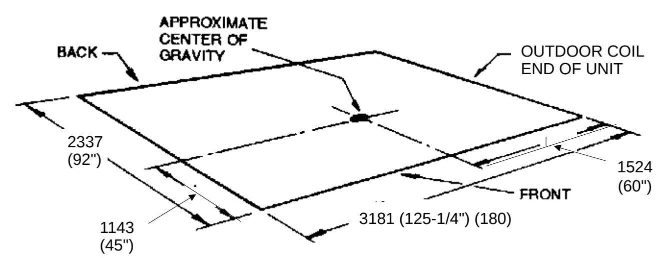


FIG. 2 - CENTER OF GRAVITY

CLEARANCES

All units require certain clearances for correct operation and service. Refer to the unit dimensions detail, Figure 7, for the clearances required for combustible construction, servicing, and unit operation.

WARNING: Do not permit overhanging structures or shrubs to obstruct outdoor air discharge outlet.

DUCTWORK

A closed return duct system shall be used. This does not preclude use of economizers or outdoor fresh air intake. The supply and return air duct connections at the unit should be made with flexible joints to minimize noise.

The supply and return air duct systems should be designed for the airflow and static requirements of the job. They should **NOT** be sized to match the dimensions of the duct connections on the unit.

CAUTION: When fastening ductwork to side duct flanges on unit, insert screws through duct flanges only. DO NOT insert screws through casing.

Outdoor ductwork must be insulated and waterproofed.

Refer to Figure 7 for information concerning side and bottom supply and return air duct openings.

FIXED OUTDOOR AIR INTAKE DAMPER

This damper assembly is shipped inside the return air compartment. It is completely assembled and ready for installation. A damper baffle inside the hood is adjustable to provide variable amounts of outdoor air intake on units that are not provided with an economizer or motorized damper option. Refer to Figure 3.

Gasketing and mounting screws are provided in a parts bag attached to the hood assembly. Apply gasketing to the three flange surfaces on the hood prior to installing the hood. Extend gasketing approximately 6mm (1/4") beyond the top and bottom of the two side flanges to ensure adequate sealing.

Adjusting the damper to the desired air flow may be done before mounting the hood into position or (after installation) by removing the front hood panel or the screen on the bottom of the hood. Damper baffle in position 1 will allow approximately 10% recirculated air flow, position 2 approximately 15% and, to allow approximately 25%, remove the damper baffle.

On units with bottom return air applications, install the damper assembly over the opening in the side return air access panel. Remove and discard the opening cover and the covering over the hood mounting holes (used for shipping) before installing. Secure with the screws provided.

On units with side air applications, install the damper assembly on the return air ductwork as close to the unit as possible. Cut an opening 406mm (16") high by 457mm (18") wide in the ductwork to accommodate the damper. Using the holes in the hood flanges as a template, drill 3.6mm (9/64") dia. (#26 drill) holes into the ductwork and secure with the screws provided.

CAUTION: If outdoor air intake will not be required on units with bottom return air applications, the damper assembly should still be mounted on the side return air access panel, per the instructions above, to ensure moisture is not drawn into the unit during operation. The covering over the mounting holes only need be removed. Do not remove the opening cover.

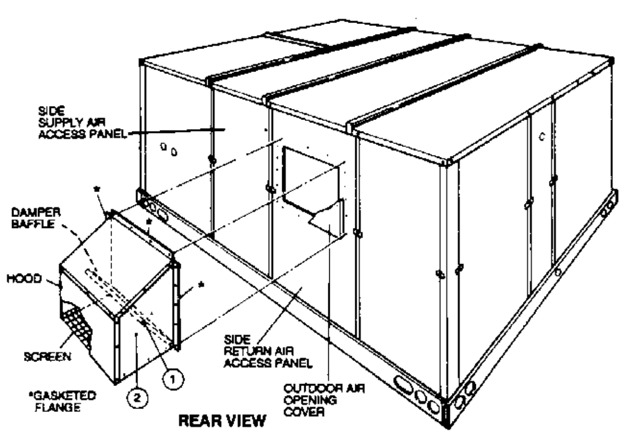


FIG. 3 - FIXED OUTDOOR AIR DAMPER

CONDENSATE DRAIN

Plumbing must conform to local codes. Use a sealing compound on male pipe threads. Install a condensate drain line from the 25mm (1" NPT) female connection on the unit to spill into an open drain.

An alternate drain connection (25mm [1" NPT] female coupling) is provided inboard on the same centerline as the exterior location.

NOTE: The condensate drain line MUST be trapped to provide proper drainage. See Figure 4.

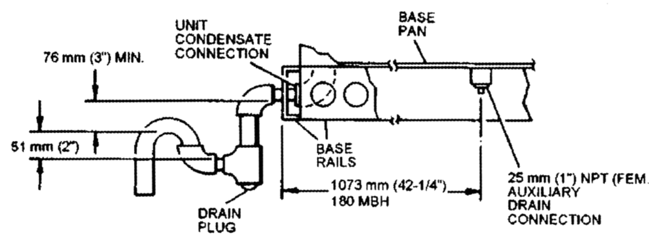


FIG. 4 - RECOMMENDED DRAIN PIPING

COMPRESSORS

Units are shipped with compressor mountings factory-adjusted and ready for operation.

*CAUTION: Do **Not** loosen compressor mounting bolts.*

FILTERS

Each unit is supplied with 51mm (2") filters. Filters must always be installed ahead of the indoor coil and must be kept clean or replaced with same size and type. Dirty filters reduce the capacity of the unit and result in frosted coils or safety shutdown. Minimum filter area and required sizes are shown in Table 3.

SERVICE ACCESS

Access to all serviceable components is provided by the following removable panels:

- Compressor compartment
- Electric Heat compartment
- Side Supply & Return Air compartments (two panels)
- Main control box
- Blower compartment (three panels)
- Filter compartment
- Outdoor Air compartment (two panels)

Refer to Figure 7 for location of these access panels.

CAUTION: Make sure that all screws and panel latches are replaced and properly positioned on the unit to maintain an air-tight seal.

THERMOSTAT

The room thermostat should be located on an inside wall approximately 1422mm (56") above the floor where it is not subject to drafts, sun exposure or heat from electrical fixtures or appliances. Follow manufacturer's instructions enclosed with thermostat for general installation procedure. Color coded

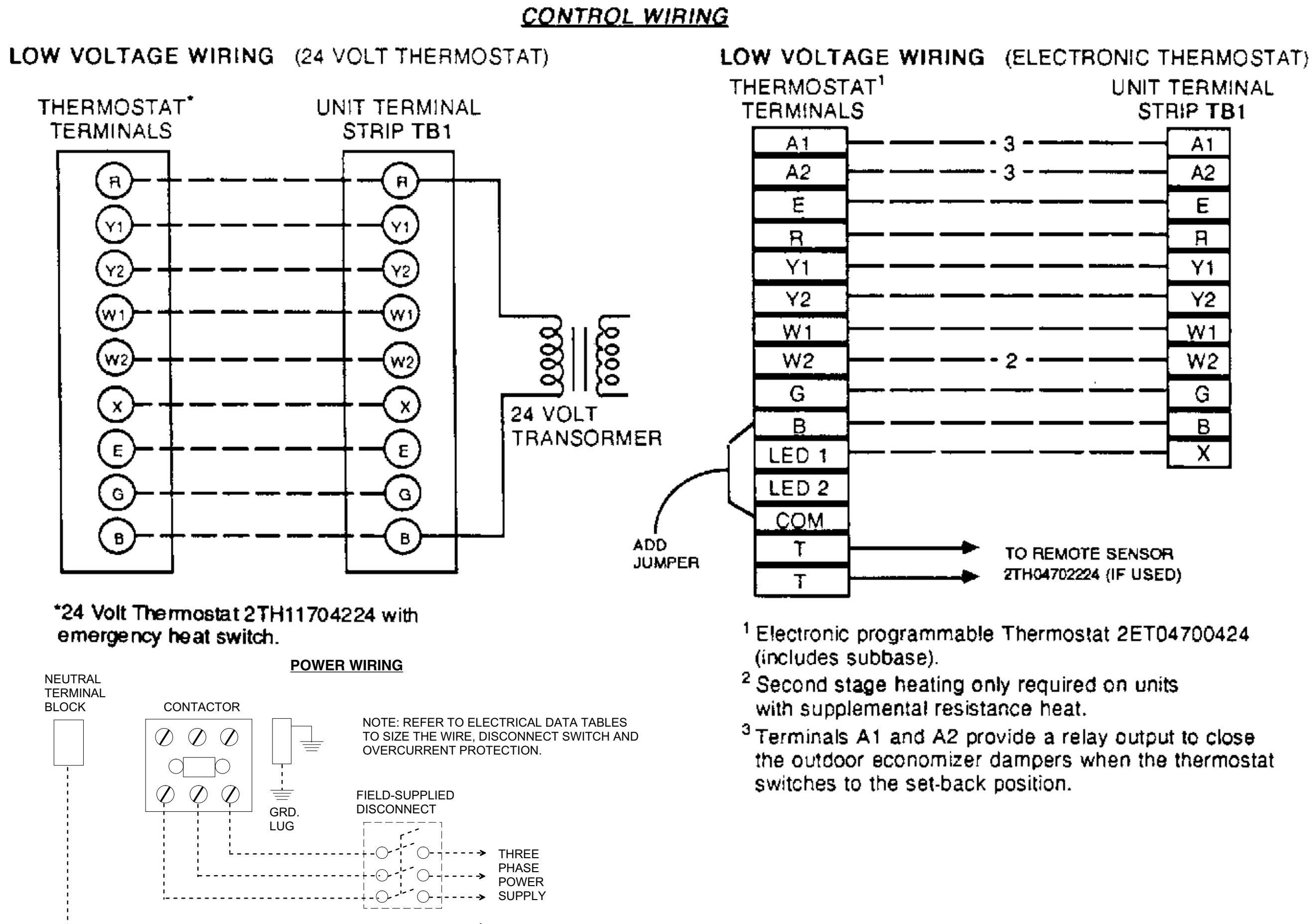


FIG. 5 - TYPICAL FIELD WIRING

insulated wires 1.0mm^2 (#18 AWG) should be used to connect thermostat to unit. Eight conductors are required.

The subbase on the low voltage thermostat includes an “Emergency Heat ” position on the system switch and a pilot light. In the “Emergency Heat” position, the thermostat provides electric resistance heat only. The compressors will not run. The pilot light indicates that the switch is on “EM HT”. Nine conductors are required for this application.

POWER AND CONTROL WIRING

Field wiring to the unit and electrical grounding of the unit must conform to the applicable national, and local or municipal codes. Voltage tolerances which must be maintained at the compressor terminals during starting and running conditions are indicated on the unit Rating Plate and Table 1.

The internal wiring harness furnished in this unit is an integral part of the unit. Field alteration to comply with electrical codes should not be required.

A fused disconnect switch should be field provided for the unit. The switch must be separate from all other circuits. Refer to Figure 7 for installation location. If any of the wire supplied with the unit must be replaced, replacement wire must be of the type shown on the wiring diagram. Refer to Table 7 for electrical data.

Electrical line must be sized correctly to carry the load. USE COPPER CONDUCTORS ONLY. Each unit must be wired with a separate branch circuit fed directly from the meter panel and properly fused.

CAUTION: When connecting electrical power and control wiring to the unit, waterproof type connectors MUST BE USED so that water or moisture cannot be drawn into the unit during normal operation. The above waterproofing conditions will also apply when installing a field-supplied disconnect switch.

Refer to Figure 5 for typical field wiring and to the appropriate unit wiring diagram for control circuit and power wiring information.

OPTIONAL ELECTRIC HEATERS

The factory installed heaters are wired for single point power supply. Power supply need only be brought into the single point terminal block and thermostat wiring to the low voltage terminal strip located in the upper portion of the unit control box.

TABLE 2 - ELECTRIC HEAT APPLICATION DATA

Heater Model	Minimum Airflow m^3/s (CFM)	Output by Operation Mode and Heat Stage kW @ 400/415V*			
		Normal Operation		Emergency Heat	
	180	W1	W2	W1	W2
E018	2.12 (4500)	Mechanical	11.3/13.5	11.3/13.5	None
E036	2.12 (4500)	Mechanical	11.3/13.5	11.3/13.5	11.3/13.5
E054	2.36 (5000)	Mechanical	11.3/13.5	11.3/13.5	22.6/26.9
E072	2.36 (5000)	Mechanical	22.6/26.9	22.6/26.9	22.6/26.9

*Refer to Table 8 for total heater output kW for the respective heater.

These heaters are located within the central compartment of the unit with the heater elements extending into the supply air chamber. Refer to Figure 7 for access panel location.

Fuses are supplied, where required, by the factory. Some KW sizes require fuses and others do not. Refer to Table 2 for minimum air flow limitations and to Table 8 for electrical data.

OPTIONAL ECONOMIZER / MOTORIZED DAMPER RAIN HOOD

The instructions for the optional economizer / motorized damper rain hood can be found in form 44-320-2. The procedures listed in those instructions should be used when field assembling an economizer rain hood onto a unit. The outdoor and return air dampers, the damper actuator, the damper linkage, the outdoor and return air divider baffles, and all the control sensors are factory mounted as part of the “factory installed” economizer option.

<u>ENTHALPY SETPOINT ADJUSTMENT</u>

Remove the economizer access panel from the unit to check the following adjustments. Loosen but do not remove the two panel latches.

CAUTION: Extreme care must be exercised in turning both the setpoint and minimum position adjusting screws to prevent twisting them off.

1. The enthapy set point for the dampers may now be set by selecting the desired setpoint shown in Figure 6. Adjust as follows:
   - For single enthalpy operation, carefully turn the setpoint adjusting screw to the “A”, “B”, “C” or “D” setting corresponding to the lettered curve.
   - For dual enthapy operation, carefully turn the setpoint adjusting screw fully clockwise past the “D” setting.
2. To check that the damper blades move smoothly without binding, carefully turn the minimum postion adjusting screw fully clockwise and then energize and de-energize terminals “R” to “G”. With terminals “R” to “G” energized, turn the minimum position screw counterclockwise until the desired minimum position has been attained.
3. Replace the economizer access panel. Reposition the two latches horizontally and retighten the screws.

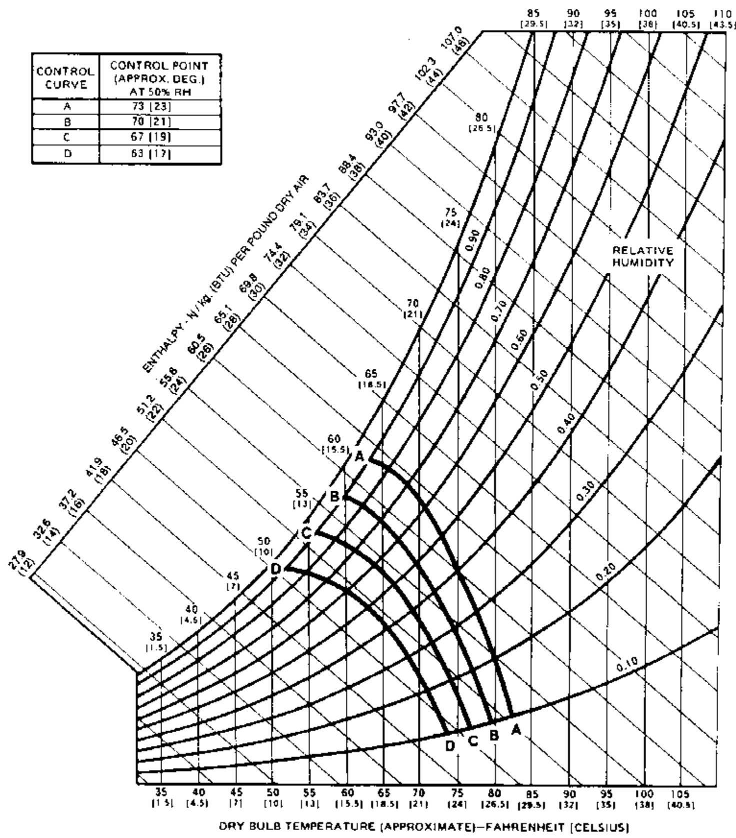


FIG. 6 - ENTHALPY SETPOINT ADJUSTMENT

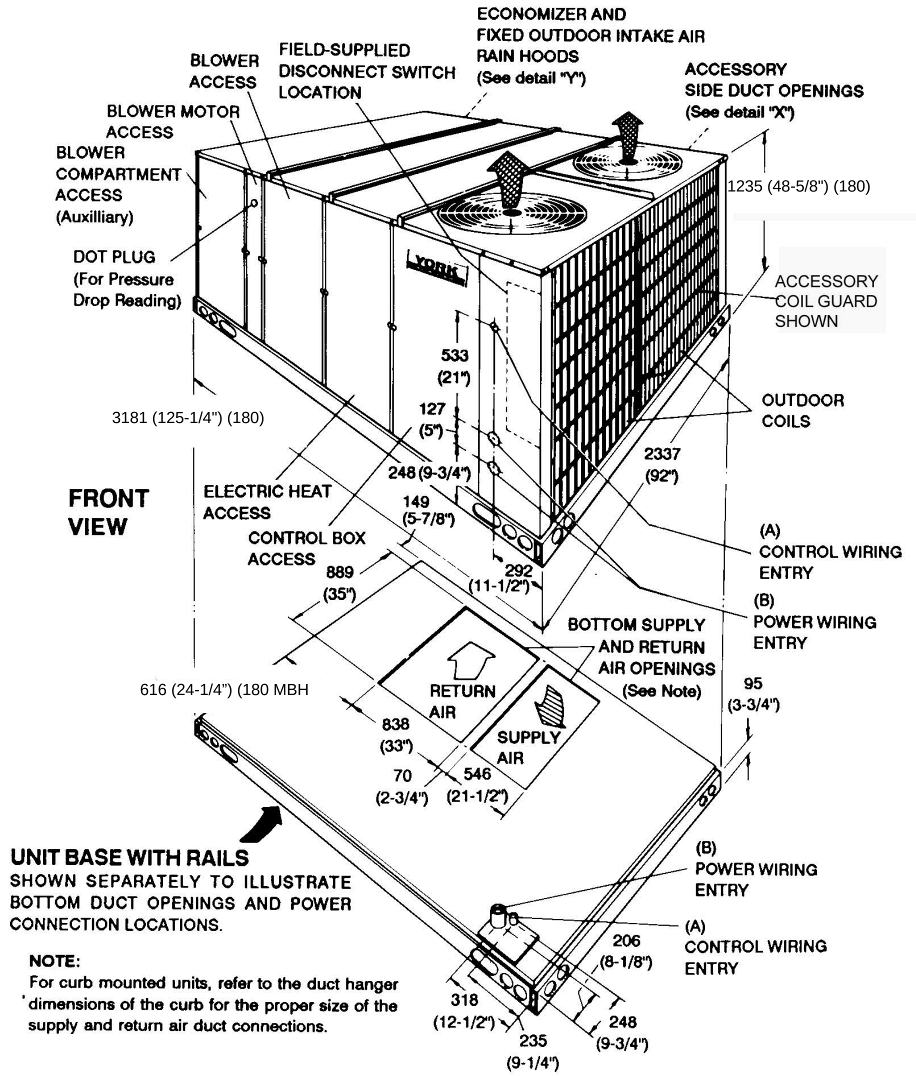
TABLE 3 - PHYSICAL DATA

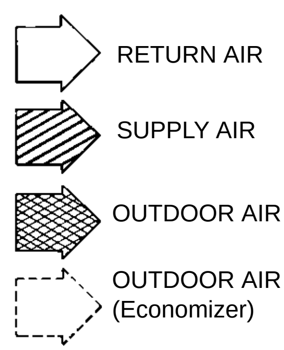
COMPONENT DESCRIPTION			UNIT SIZE 180
SUPPLY AIR BLOWER	CENTRIFUGAL BLOWER	DIA. x WD. (mm)	381 x 381
		DIA. x WD. (in.)	15 x 15
	FAN MOTOR	kW / HP	3.0 / 4
INDOOR COIL	ROWS DEEP		4
	FINS PER INCH		13
	FACE AREA	m^2 / $Ft.^2$	1.45 / 15.5
OUTDOOR FANS (Two Per Unit)	PROPELLER DIA.	mm / in.	762 / 30 ea.
	FAN MOTOR	kW / HP	0.7 / 1 ea.
	NOMINAL AIRFLOW	m^3/s	2.83 ea.
		CFM	6000
OUTDOOR COIL	ROWS DEEP		3
	FINS PER INCH		15
	FACE AREA	m^2 / $Ft.^2$	3.35 / 36.0
COMPRESSOR (Qty. Per Unit)	SCROLL (6.5 TON NOMINAL CAPACITY)		2
AIR FILTERS (SEE NOTE)	QUANTITY PER UNIT	457 x 610 x 51 (mm)	5
		18 x 24 x 2 (in.)	
	TOTAL FACE AREA	m^2 / $Ft.^2$	1.40 / 15.0
CHARGE	REFRIGERANT 22	SYS. #1 (kg. / lbs.)	9.5 / 21.0
		SYS. #2 (kg. / lbs.)	9.5 / 21.0

NOTE: Filter racks are adapted to accept 25mm (1") or 51mm (2") filters.

WEIGHTS (kg. / lbs.)		
BASIC UNIT	180	948 / 2091
OPTIONS		
Economizer		73 / 160
Motorized Damper		68 / 150
Electric Heater	18 kW	11 / 25
	36kW	14 / 30
	54 kW	16 / 35
	72 kW	18 / 40
ACCESSORIES		
Roof Curb	180	79 / 175
Barometric Damper		20 / 45
Wood Skid*	180	91 / 200

*Allows handling of unit using 2286mm (90") long forks.





All dimensions are in millimeters and inches, unless otherwise specified. They are subject to change without notice. Certified dimensions will be provided upon request.

CLEARANCES (mm / in.)

Front	914 / 36
Back	610 / 24 (Less Economizer) 1245 / 49 (With Economizer)
Left Side (Filter Access)	610 / 24
Right Side (Outdoor Coil)	914 / 36
Below Unit	0 / 0
Above Unit*	1829 / 72 With 914 / 36 Maximum Horizontal Overhang (For Outdoor Air Discharge)

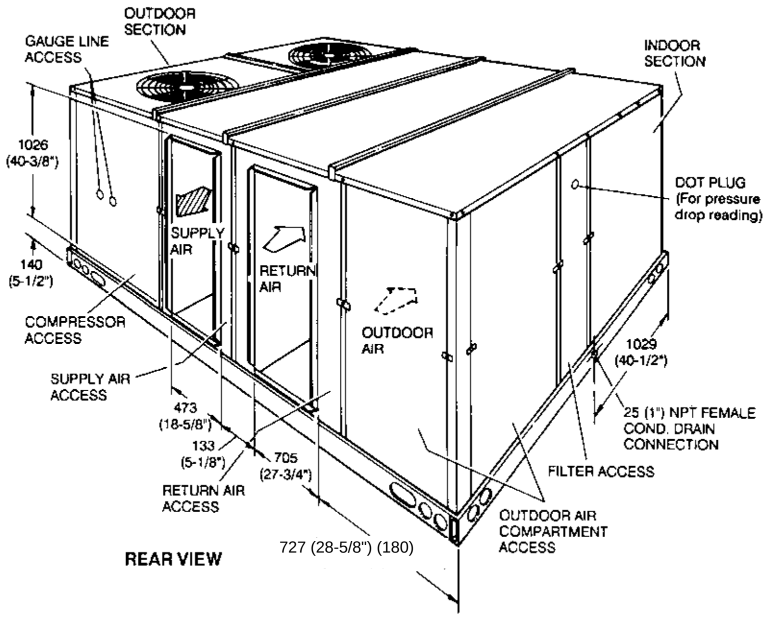
NOTE: Unit and ductwork are approved for zero clearance to combustible materials when equipped with electric heat.

*Units must be installed oudoors. Overhanging structures or shrubs should not obstruct outdoor air discharge outlet.

UTILITIES ENTRY DATA

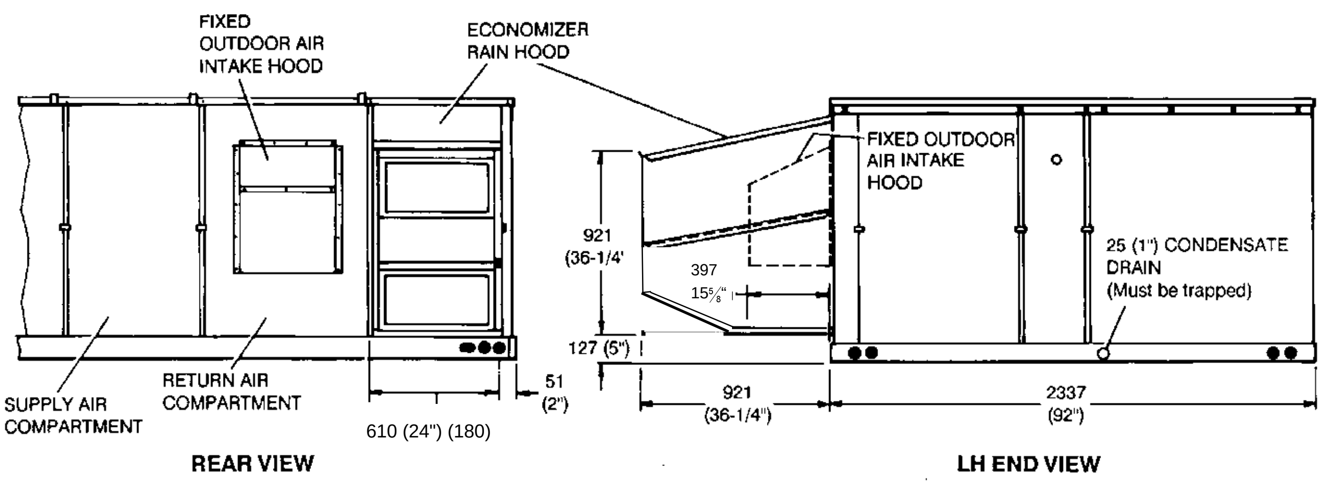
HOLE	OPENING DIAMETER (mm / in.)	USED FOR	
A	28.6 / 1-1/8 KO	Control Wiring	Front
	19.1 / 3/4 NPS (Fem.)		Bottom
B	92.1 / 3-5/8 KO	Power Wiring	Front
	76.2 / 3 NPS (Fem.)		Bottom

FIG. 7 - DIMENSIONS AND CLEARANCES



DUCT COVERS - Units are shipped with all air duct openings covered.
For sideflow duct applications;
1.Remove and discard the side supply and return air duct covers.
2.Connect ductwork to duct flanges on the rear of the unit.
For downflow duct applications;
1. Remove the side supply and return air duct covers to gain access to the bottom supply and return air duct covers.
2. Remove and discard the bottom duct covers.
3. Replace the side duct covers.

DETAIL "X"
ACCESSORY SIDE SUPPLY AND RETURN AIR DUCT OPENINGS



DETAIL "Y"
UNIT WITH ECONOMIZER AND FIXED OUTDOOR AIR HOODS

FIG. 7 (Cont'd.) - DIMENSIONS AND CLEARANCES

TABLE 4 - SUPPLY AIR BLOWER PERFORMANCE

DOWNFLOW DUCT APPLICATIONS (m^3 /s) - B*CH180 UNIT

BLOWER SPEED, RPM	MOTOR PULLEY (TURNS OPEN)*	AIRFLOW														
		1.77 m^3/s			2.07 m^3/s			2.36 m^3/s			2.66 m^3/s			2.95 m^3/s		
		ESP (Pa)	Output (kW)	Input (kW)	ESP (Pa)	Output (kW)	Input (kW)	ESP (Pa)	Output (kW)	Input (kW)	ESP (Pa)	Output (kW)	Input (kW)	ESP (Pa)	Output (kW)	Input (kW)
845	6.0	273	1.56	1.8	223	1.79	2.2	198	2.09	2.5	174	2.38	2.9	149	2.68	3.2
885	5.0	322	1.64	1.9	273	1.94	2.3	223	2.24	2.7	198	2.53	3.1	174	2.83	3.4
925	4.0	372	1.71	2.1	322	2.01	2.5	248	2.38	2.9	223	2.68	3.3	-	-	-
960	3.0	422	1.79	2.2	347	2.16	2.6	298	2.46	3.0	248	2.83	3.4	-	-	-
1000	2.0	446	1.86	2.3	397	2.24	2.7	347	2.61	3.2	-	-	-	-	-	-
1040	1.0	496	1.94	2.4	446	2.38	2.9	372	2.76	3.3	-	-	-	-	-	-

DOWNFLOW DUCT CONNECTIONS (CFM) - B*CH180 UNIT

BLOWER SPEED, (RPM)	MOTOR PULLEY (TURNS OPEN)*	AIRFLOW														
		3750 CFM			4380 CFM			5000 CFM			5630 CFM			6250 CFM		
		ESP (iwg)	Output (bhp)	Input (kW)	ESP (iwg)	Output (bhp)	Input (kW)	ESP (iwg)	Output (bhp)	Input (kW)	ESP (iwg)	Output (bhp)	Input (kW)	ESP (iwg)	Output (bhp)	Input (kW)
845	6.0	1.1	2.1	1.8	0.9	2.4	2.2	0.8	2.8	2.5	0.7	3.2	2.9	0.6	3.6	3.2
885	5.0	1.3	2.2	1.9	1.1	2.6	2.3	0.9	3.0	2.7	0.8	3.4	3.1	0.7	3.8	3.4
925	4.0	1.5	2.3	2.1	1.3	2.7	2.5	1.0	3.2	2.9	0.9	3.6	3.3	-	-	-
960	3.0	1.7	2.4	2.2	1.4	2.9	2.6	1.2	3.3	3.0	1.0	3.8	3.4	-	-	-
1000	2.0	1.8	2.5	2.3	1.6	3.0	2.7	1.4	3.5	3.2	-	-	-	-	-	-
1040	1.0	2.0	2.6	2.4	1.8	3.2	2.9	1.5	3.7	3.3	-	-	-	-	-	-

NOTES: 1. Blower performance includes fixed outdoor air, standard unit filters, a dry indoor coil and no electric heat.

2. Refer to Table 5 for additional static resistances.

ESP = External Static Pressure available for the supply and return air duct system. All internal unit resistances have been deducted from the total static pressure of the blower.

* Do NOT close the pulley below 1 turn open.

TABLE 5 - STATIC RESISTANCES[1]

DESCRIPTION		EXTERNAL STATIC PRESSURE DROP - RESISTANCE, iwg/Pa m³/s (CFM) 180 UNIT			
		1.77 (3750)	2.12 (4500)	2.48 (5250)	2.83 (6000)
WET COIL		0.1 / 25	0.1 / 25	0.1 / 25	0.1 / 25
ELECTRIC HEAT OPTIONS	18 kW	0.1 / 25	0.1 / 25	0.1 / 25	0.1 / 25
	36 kW	0.1 / 25	0.1 / 25	0.2 / 50	0.2 / 50
	54 kW	0.1 / 25	0.2 / 50	0.2 / 50	0.3 / 75
	72 kW	0.1 / 25	0.2 / 50	0.3 / 75	0.4 / 99
ECONOMIZER OPTION		0.1 / 25	0.1 / 25	0.1 / 25	0.1 / 25
SIDEFLOW DUCT CONNECTIONS[2]		0.2 / 50	0.2 / 50	0.3 / 75	0.3 / 75

[1]Deduct these resistance values from the available external static pressures shown in the respective Blower Performance Table. (See Note 2 for exception).

[2]Since the resistance to air flow will be less for sideflow duct connections than for downflow duct connections, add these pressures to the ESP values listed on the respective blower performance table.

TABLE 6 - BLOWER MOTOR AND DRIVE DATA

UNIT SIZE (MBH)	BLOWER RANGE (RPM)	MOTOR[1]			ADJUSTABLE MOTOR PULLEY[2]			FIXED BLOWER PULLEY			BELT (NOTCHED)		
		kW/HP	FRAME SIZE	EFF. (%)	PITCH DIA. (mm / in.)	BORE (mm / in.)	DESIG-NATION	PITCH DIA. (mm / in.)	BORE (mm / in.)	DESIG-NA-TION	PITCH LENGTH (mm / in.)	DESIG-NATION	QTY
180	845 - 1040	3.0/4.0	184T	83	109 - 135 / 4.3 - 5.3	29 / 1-1/8	1VP56	188 / 7.4	25 / 1	BK80	1773 / 69.8	BX68	1

[1] All motors are 1450 RPM, have solid bases and a 1.10 service factor.
[2]Do NOT close this pulley below 1 turn open.

TABLE 7 - ELECTRICAL DATA (BASIC UNITS)

UNIT MODEL	POWER SUPPLY (VOLTS)	COMPRESSOR (#1 and #2)		OUTDOOR FAN MOTOR, (#1 & #2)	SUPPLY AIR BLOWER MOTOR	MINIMUM CIRCUIT AMPACITY, (AMPS)	MAXIMUM FUSE SIZE[1]
		RLA EACH	LRA EACH	FLA EACH	FLA		
180	380-415/3/50	12.8	95	2.1	8.6	41.6	50

NOTES: 1. Slow blow type fuse.
2. Based on 105°C copper conductors.

TABLE 8- ELECTRICAL DATA (UNITS WITH ELECTRIC HEAT)

UNIT MODEL	POWER SUPPLY (VOLTS)	HEATER OPTION				MINIMUM CIRCUIT AMPACITY (AMPS)	MAXIMUM FUSE SIZE[1]
		MODEL	kW	STAGES	AMPS		
180	380-3-50	E018	11.3	1	17.1	63.1	70
		E036	22.6	2	34.3	63.1	70
		E054	33.8	2	51.4	75.0	80
		E072	45.1	2	68.6	96.5	100
	415-3-50	E018	13.5	1	18.7	65.0	70
		E036	26.9	2	37.4	65.0	70
		E054	40.4	2	56.2	80.9	90
		E072	53.8	2	74.9	104.3	110

NOTES: 1. Slow blow type fuse.
2. Based on 105°C copper conductors.

OPERATION

COOLING SYSTEM

The cooling section is a complete factory package utilizing an air-cooled condenser. The system is factory-charged with Refrigerant-22.

The compressors are hermetically sealed, internally sprung and base-mounted with rubber-insulated hold-down bolts.

The compressors also have inherent (internal) protection. If there is an abnormal temperature rise in a compressor, the protector opens to shut down the compressor.

PRELIMINARY OPERATION

After installation has been completed, energize the crankcase heaters for at least four hours before operating unit. After this initial warm-up, the compressors should be given three false starts (energized just long enough to make a few revolutions) with 5-7 minutes delay between each start before being put into full time service.

NOTE: Prior to each cooling season, the crankcase heaters must be energized at least 8 hours before system is put into operation.

COOLING SEQUENCE OF OPERATION

NO OUTDOOR AIR OPTIONS - When the room thermostat calls for “first-stage” cooling, the low voltage control circuit from “R” to “G” and “Y1” is completed to energize compressor #1, outdoor fan motor #1, outdoor fan motor #2 (if the ambient temperature is above 16°C (60°F)), and the supply air blower motor (if the fan switch on the room thermostat is set in the “AUTO” position).

When the thermostat calls for “second-stage” cooling, the low voltage control circuit from “R” to “Y2”is completed to energize compressor #2.

After the thermostat is satisfied and opens, all components stop simultaneously. The blower motor continues to operate if the fan switch on the room thermostat is set in the “ON” position.

The reversing valve is energized thru the “Y1” circuit when the subbase is in the cooling mode.

The suction line freezestat cuts the compressors out when the suction line temperature drops below -3°C (26°F). This is an automatic reset device.

ECONOMIZER WITH SINGLE ENTHALPY SENSOR - When the room thermostat calls for “first-stage” cooling, the low voltage control circuit from “R” to “G” and “Y1” is completed. The “R” to “G” circuit energizes the blower motor (if the fan switch on the room thermostat is set in the “AUTO” position) and drives the economizer dampers from fully closed to their minimum position. If the enthalpy of the outdoor air is below the setpoint of the enthalpy controller (previously determined), “Y1” energizes the economizer. The dampers modulate to maintain a constant supply air temperature as monitored by the discharge air sensor. If the outdoor air enthalpy is above the setpoint, “Y1” energizes compressor #1, outdoor fan motor #1, and outdoor fan motor #2 (if the ambient temperature is above 16°C (60°F)).

When the thermostat calls for “second-stage” cooling, the low voltage control circuit from “R” to “Y2” is completed. If the enthalpy of the outdoor air is below the setpoint of the enthalpy controller (i.e., first stage has energized the economizer), “Y2” energizes compressor #1. If the outdoor air is above the setpoint, “Y2” energizes compressor #2.

After the thermostat is satisfied and opens, all components stop simultaneously. The blower motor continues to operate if the fan switch on the room thermostat is set in the “ON” position.

ECONOMIZER WITH DUAL ENTHALPY SENSORS - The operation with the dual enthalpy sensors is identical to the single sensor except that a second enthalpy sensor is mounted in the return air. This return air sensor allows the economizer to choose between outdoor air and return air, whichever has the lowest enthalpy value, to provide maximum operating efficiency.

ECONOMIZER (SINGLE OR DUAL) WITH POWER EXHAUST - This system operates as specified above with one addition. The power exhaust motor is energized whenever the economizer is chosen by the enthalpy sensor for first stage cooling, “Y1”. As always, the “R” to “G” connection provides minimum position but does not provide power exhaust operation.

MOTORIZED OUTDOOR AIR DAMPERS - This system operation is the same as the units with no outdoor air options with one exception. When the “R” to “G” circuit is complete, the motorized damper drives open to a position set by the thumbwheel on the damper motor. When the “R” to “G” circuit is opened, the damper spring returns fully closed.

HEATING SEQUENCE OF OPERATION

The following sequence of operation is based on using a standard heat pump two-stage heating/two-stage cooling thermostat/subbase. Economizer (if supplied) operation is not allowed in the heating mode; however, the minimum position does operate.

FIRST STAGE HEAT

When the thermostat calls for “heating”, the low voltage control circuit from “R” to “G”and “W1” (wiring schematic) is completed to energize the compressors, outdoor fan motors and blower motor (if subbase is set on auto) simultaneously. If the subbase has the indoor fan set on “on” the motor will run all of the time.

SECOND STAGE HEAT

If the compressors alone can not satisfy the heating requirements, second stage heat energizes all the electric heat (if supplied) thru the “W2” circuit.

HEAT ANTICIPATOR SETPOINT

It is important that the anticipator setpoint be correct. Too high a setting results in longer heat cycles and a greater temperature swing in the conditioned space. Reducing the value below the correct setpoint causes shorter “ON” cycles and may result in the lowering of the temperature within the conditioned space. Refer to Table 9 for the required heat anticipator setting.

TABLE 9 - HEAT ANTICIPATOR SETTING

HEATER kW	SETTING, AMPS	
	TH1	TH2
18	0.29	-
36	0.29	0.29
54	0.29	0.29
72	0.29	0.29

CHECKING SUPPLY AIRFLOW

The RPM of the supply air blower will depend on the required airflow, the unit accessories and the static resistances of both the supply and the return air duct systems. With this information, the RPM for the supply air blower and the motor pulley adjustment (turns open) can be determined from the blower performance data in Table 4.

Knowing the required blower RPM and the blower motor HP, the setting (turns open) for the supply air motor pulley can be determined from Table 10.

BELT DRIVE BLOWER

All units have belt drive single-speed blower motors. The variable pitch pulley on the blower motor can be adjusted to obtain the desired supply air flow.

<u>Note the following</u>:

1. The supply airflow must be within the limitations shown in Table 1.
2. Pulleys can be adjusted in half turn increments.
3. The tension on the belt should be adjusted as shown in Figure 8.

Start the supply air blower motor. Adjust the resistances in both the supply and the return air duct systems to balance the air distribution throughout the conditioned space. The job specifications may require that this balancing be done by someone other than the equipment installer.

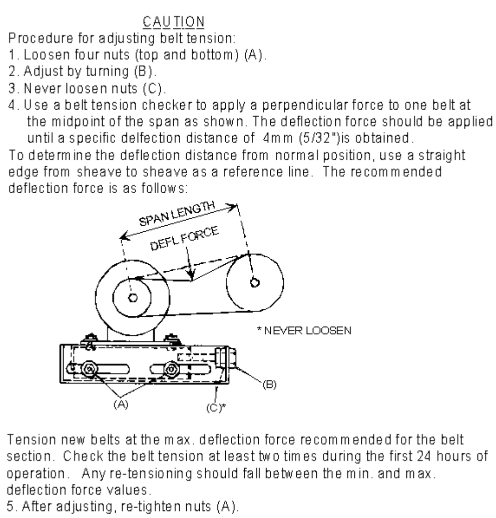


FIG. 8 - BELT ADJUSTMENT

TABLE 10 - SUPPLY AIR BLOWER MOTOR PULLEY ADJUSTMENT

TURNS OPEN*	BLOWER DRIVE RANGE (RPM)
	180 UNIT
6	845
5	885
4	925
3	960
2	1000
1	1040

*Pulleys can be adjusted in half-turn increments.
Do NOT close pulley below 1 turn open.

<u>To check the supply airflow after the initial balancing has been completed:</u>

1. Remove the two dot plugs from the blower motor and the filter access panels shown in Figure 7.
2. Insert at least 200mm (8") of tubing (approximately 6mm (1/4") diameter) into each of these holes for sufficient penetration into the air flow on both sides of the indoor coil.

   NOTE: The tubes must be inserted and held in a position perpendicular to the air flow so that velocity pressure will not affect the static pressure readings.

3. Using an inclined manometer, determine the pressure drop across a dry indoor coil. Since the moisture on an indoor coil may vary greatly, measuring the pressure drop across a wet coil under field conditions would be inaccurate. To ensure a dry coil, the compressors should be de-energized while the test is being run.
4. Knowing the pressure drop across a dry coil, the actual air flow through the unit and clean filters, can be determined from the curve in Figure 9.

WARNING: Failure to properly adjust the total system air quantity can result in extensive blower damage.

After readings have been obtained, remove the tubes and reinstall the two dot plugs that were removed in Step 1.

NOTE: DE-ENERGIZE THE COMPRESSORS BEFORE TAKING ANY TEST MEASUREMENTS TO ENSURE A DRY INDOOR COIL.

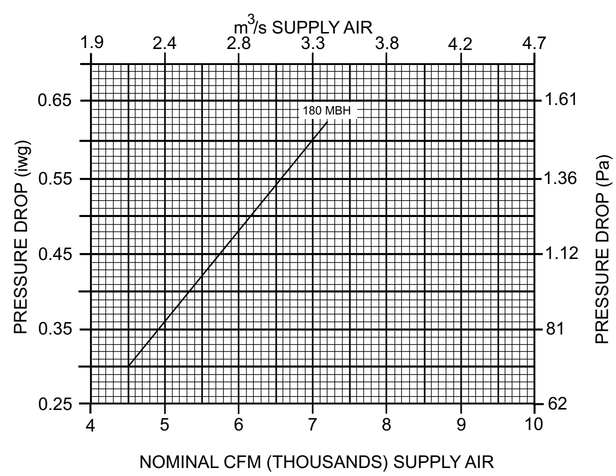


FIG. 9 - PRESSURE DROP ACROSS A DRY INDOOR COIL VS SUPPLY AIRFLOW

DEFROST SEQUENCE OF OPERATION

These heat pumps have a unique "ambient modified" time-temperature defrost control that automatically adjusts to changes in the outdoor temperature. The defrost control shortens the defrost initiation time periods above 2°C (35°F) and extends the defrost initiation time periods below 2°C (35°F. The control is factory set to defrost at 110 minutes (T3), but it can be field adjusted to defrost at 80 minutes (T2) or 50 minutes (T1) in areas with high humidity.

The curve in Figure 10 shows how defrost initiation times are automatically compensated for changes in outdoor temperature.

EXAMPLE: If the timer is factory set on pin T3 (110 minutes at 2°C (35°F) outdoor) and the outdoor temperature climbs to 7°C (45°F), the time initiation cycle decreases to 100 minutes.

If the outdoor temperature drops to -12°C (10°F) where ice is less likely to form, the 110 minute interval increses to 150 minutes.

Two requirements must be met before a defrost cycle can be initiated.

1. The defrost time cycle must be complete.

2. The liquid line temperature must be less than -2°C (28°F).

Defrost terminates when the liquid line sensor reaches 13°C (55°F) or after 10 minutes. If one or both circuits defrosts, electric heat is energized.

The defrost time cycle restarts 10 minutes after the start of the defrost cycle even though the liquid sensor terminated defrost after three minutes.

During troubleshooting, the defrost time can be reduced to 20 seconds by shorting out the SW1 test pegs on the module. The pegs are 13mm (½ in.) long, 5mm (3/16 in.) apart and are mounted on a white base. See Figure 11.

LOCKOUT CONTROL

Any one of four conditions put the system into a lock-out condition during the heating or cooling mode:

1. The discharge line temperature reaches 124°C (255°F) (102°C reset [215°F]) or,

2. The discharge pressure reaches 2,786 kPa (398 psig) (2,170 kPa reset [310 psig]) or,

3. The suction line freezestat equals -3°C (26°F) (3°C reset [38°F]), or

4. The low-pressure cut-out equals 49 kPa (7 psig) (154 kPa [22 psig]).

A lock-out energizes the emergency heat light on the thermostat and the red LED light on the unit relay board. Turning the thermostat switch to "off", then back to "on" will reset the system.

NOTICE TO OWNER:

If a lockout occurs, check for the following problems before calling a serviceman:

1. Dirty filters.

2. Snow accumulation.

3. Leaf or debris blockage.

After eliminating the problem, attempt to restart the system as follows:

- *turn the system switch on the thermostat to its "OFF" position for 10 seconds.*
- *turn it back to its original position.*

If the unit doesn't start, call a service man.

NOTE: Models with an anti-cycle accessory have a five minute delay before restarting.

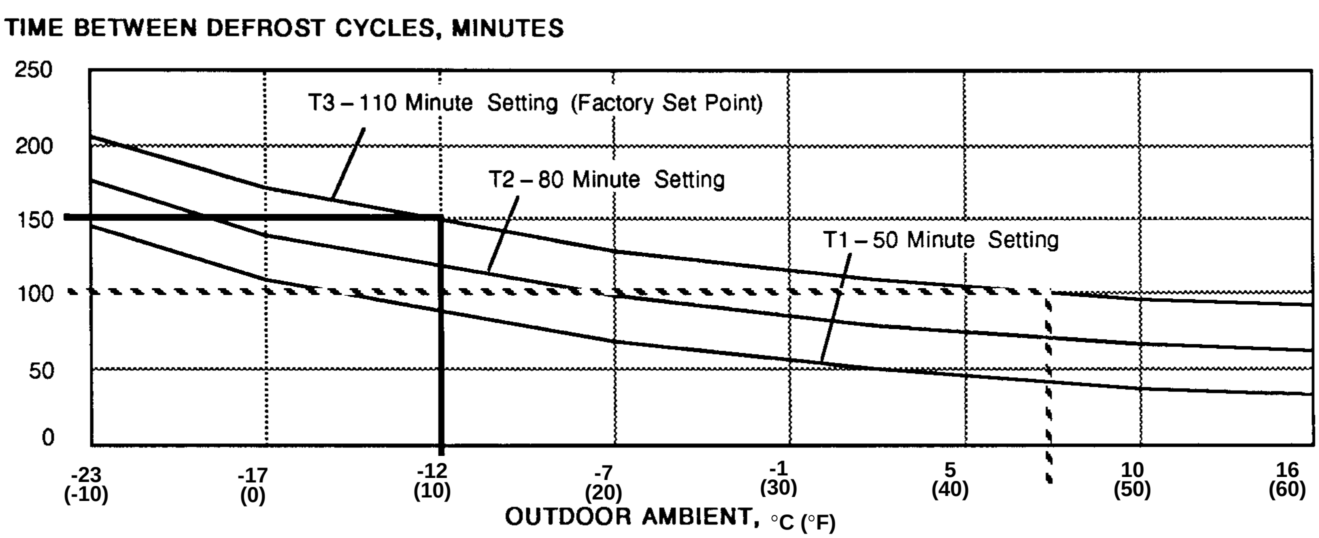


FIG. 10 - DEFROST INITIATION TIMES

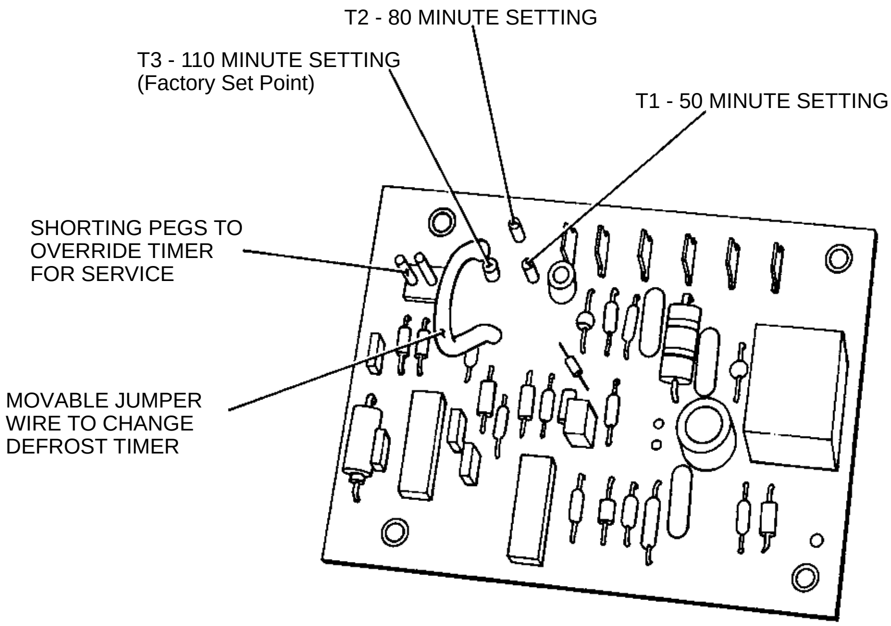


FIG. 11 - AMBIENT MODIFIED TIME/TEMPERATURE CONTROL

SECURE OWNER'S APPROVAL: *When the system is functioning properly, secure the owner's approval. Show him the location of all disconnect switches and the thermostat. Teach him how to start and stop the unit and how to adjust temperature settings within the limitations of the system.*

MAINTENANCE

NORMAL MAINTENANCE

CAUTION: Prior to any of the following maintenance procedures, shut off all power to the unit to prevent personal injury.

FILTERS - Inspect once a month. Replace disposable or clean permanent type as necessary. DO NOT replace permanent type with disposable. The dimensional size of the replacement filter must be the same as the replaced filter.

MOTORS

<u>Outdoor fan motors</u> are permanently lubricated and require no maintenance.

<u>Indoor Blower Motor and Drive</u> - The indoor blower motor features ball-bearings that do not require periodic lubrication. Periodic lubrication of the motor and bearings can extend the life of components but is optional.

CAUTION: Damage can occur if the bearings are overlubricated. Use grease sparingly.

WARNING:

Perform all maintenance operations on the blower motor with power disconnected from the unit. Do not attempt to lubricate bearings with the unit in operation.

On an annual basis, check the motor for accumulations of dust, etc. that may block the cooling slots in the motor shell. Check for loose, damaged or misaligned drive components. Check that all mounting bolts are tight. Replace defective parts as required.

If desired, every three years remove both pipe plugs at each end shell and clean out any hardened grease or foreign matter. Replace one plug on each end with a clean grease fitting. Using a low pressure grease gun, pump grease (Chevron SR1-2 or equivalent) into the bearing cavity until new grease shows at the open port. Do not over-lubricate. Run the motor for ten minutes until excess grease is purged from the cavity. Replace the plugs.

OUTDOOR COIL - Dirt should not be allowed to accumulate on the outdoor coil surface or other parts in the air circuit. Cleaning should be as often as necessary to keep coil clean. Use a brush, vacuum cleaner attachment, or other suitable means. If water is used to clean coil, be sure power to the unit is shut off prior to cleaning.

NOTE: Exercise care when cleaning the coil so that the coil fins are not damaged.

Do not permit the outdoor air discharge to be obstructed by overhanging structures or shrubs.

Heating and Air Conditioning

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